

ENTERPRISE ARCHITECTURE TECHNICAL BRIEF

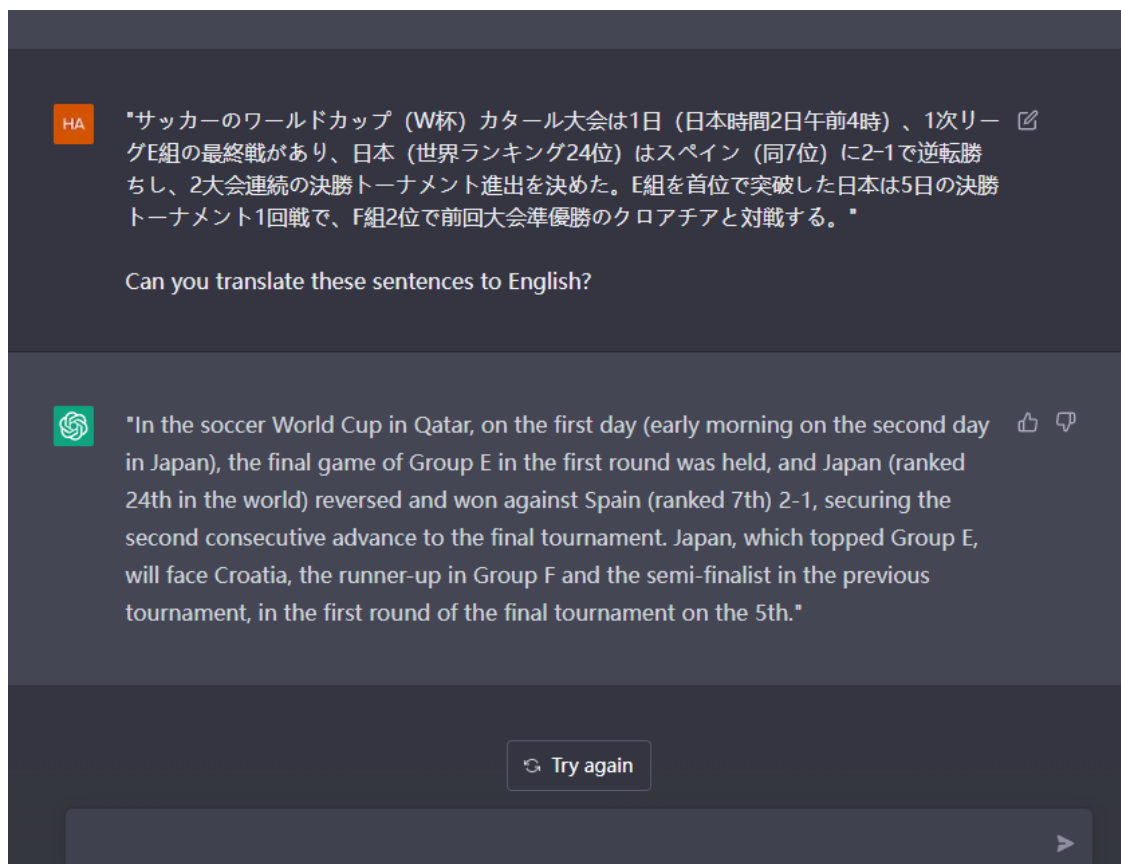
≧ Chatbots ≦



Robert Kowalke

TABLE OF CONTENTS

TABLE OF CONTENTS	1
Introduction	2
Recommendation	3
Chatbot Overview	9
What is a Chatbot?	9
Chatbot's in Virginia Government	10
ChatGPT	11
ChatGPT Summary on Itself	11
Enterprise Architecture Research	12
Pictorial Research	26



Translate by ChatGPT ¹.

¹ ChatGPT: The Most Advanced AI Chatbot in 2022. Retrieved January 2023 from <https://chatgpt.pro/>.

INTRODUCTION

This high-level technical research on chatbots with emphasis on the popular ChatGPT is in support of VITA enterprise architecture policies, standards, and guidelines. Research from this report intends to help Commonwealth agencies make their implementation determinations regarding technology such as ChatGPT through providing needed background information to save research time or provide an initial overview for those who simply want to be informed quickly on chatbots and ChatGPT specifically, without having to hit the web and find suitable information to read first. Given the fluid nature of ChatGPT, in that this type of technology can change quickly while articles are being written about it, the research contained within this report has been primarily written to maintain applicability for the near future of one year and providing background information when read in subsequent years. This report is located on the [VITA EA web page](#).



ChatGPT holographic picture ².

For any comments, questions, and/or concerns regarding this technical brief, [please contact VITA EA](#).

² ChatGPT creator and OpenAI in talks for tender offer at \$29B USD valuation. Retrieved from <https://seekingalpha.com/news/3922500-chatgpt-creator-openai-in-talks-for-tender-offer-at-29b-valuation-report>.

RECOMMENDATION

The Commonwealth has been leveraging chatbots / virtual assistants (conversational agents ³) for some years now and will continue to evolve capabilities in this area to support improved services. The Virginia IT Agency has been offering aspects of Artificial Intelligence as a Service (AlaaS) specific services since 2022 with plans to continue in areas providing value for the Commonwealth's citizen-to-government interactions. Some use-case examples for practical use of AI as of January 2023 include:

- Sentiment analysis – also known as (aka) opinion mining or emotion AI; to determine if the text is positive, negative, or neutral. Think of this in terms of customer feedback analysis with the customer being the citizen or other agency staff interactions.
- Automatic Language translation – to determine the writer's language as written and translate it to English. Then to translate responses back to the original language of the writer.
- Intelligent virtual assistants – to resolve basic queries by citizens via chatbots that do not need the intervention of a person to answer (hours, location, office handling this type of matter, et. al.).
 - Also, consider having a personal assistant assigned to you, the Commonwealth citizen, at the beginning of your query. This assistant then follows you throughout your specific query (or it could be several), regardless of how complex the query answers become, or how many people need to get involved for a satisfactory resolution. The virtual assistant would help to preserve continuity of information flow, meaning you do not have to answer the same information over and over and over to each person who gets involved in the query. That alone would be a timesaver and accelerate completion of your query. This customer service automation would be very helpful navigating the often-complex world of law, directives, policies, and guidelines, inherent when interacting with government.
- Speech recognition – to identify words spoken and convert them into readable text. For example, think of courtrooms, VEC hearings, board of supervisor meetings, and public hearings in general.
- Automation of routine tasks – such as freedom of information (FOI) requests, repetitive aspects of government services, or day-to-day real-estate or litigation business filings.
- Text summarization – when researching documents, summarization allows faster researching to arrive at the complete set of documents one may need for a particular research project. This would be superb for academic research and analysis as an



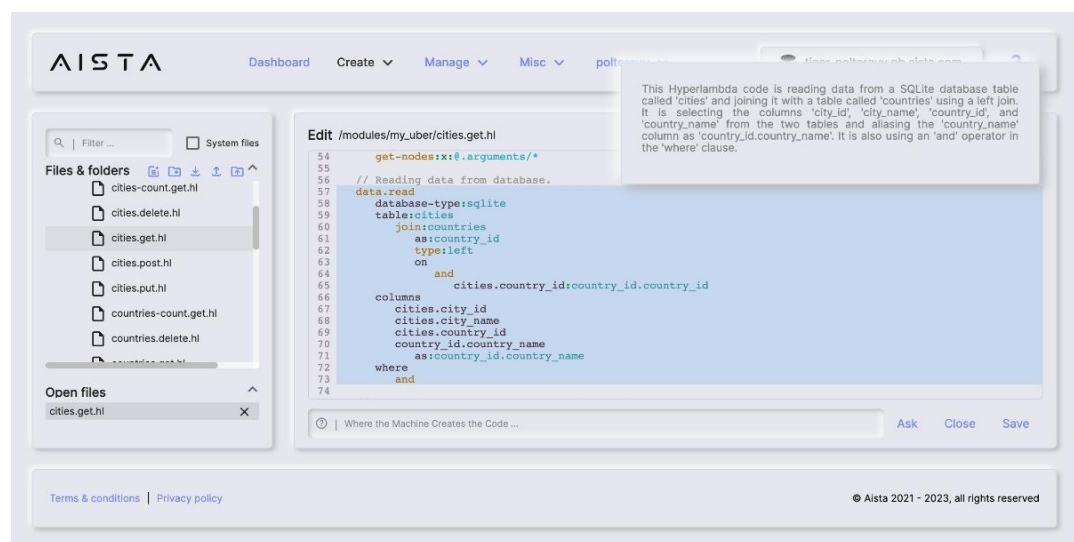
³ The Difference Between Chatbot and Virtual Assistant? E-Spin Corporation – March 16, 2018. Retrieved from <https://www.e-spincorp.com/the-difference-between-chatbot-and-virtual-assistant/>.

example because time is saved during research to allow more time for analysis.

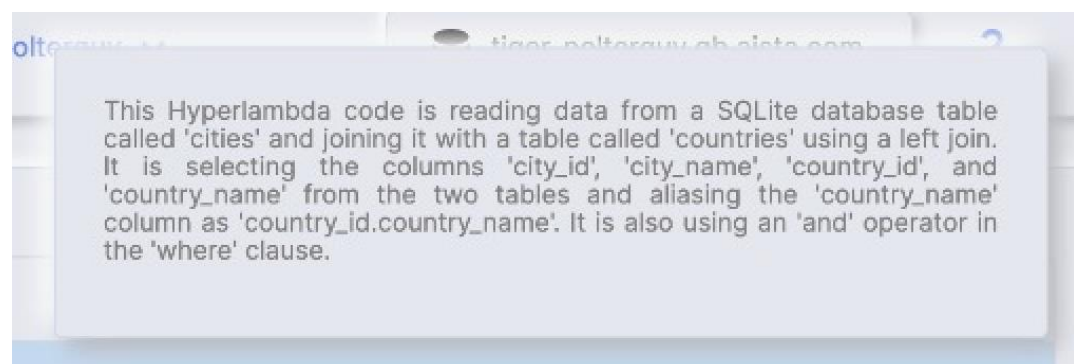
- Software documentation – the age-old problem of no documentation for a particular code or software is now solved – just have ChatGPT analyze the code and summarize it for coders and non-coders alike. Now documentation can be referenced on-the-fly without having to generate it in advance and adding it to a software release.

Look at the following picture and realize the documentation parts in the top right corner were automatically generated by selecting some Hyperlambda code and clicking F1.

As far as the author is concerned the above is nothing less of a software development miracle! It was created by scraping their documentation website for machine learning training data. Then they simply included an API call inside their Magic Dashboard towards the OpenAI API when a user clicks F1, passing in the selected code to have ChatGPT explain the code.



ChatGPT generated text from software code ⁴.

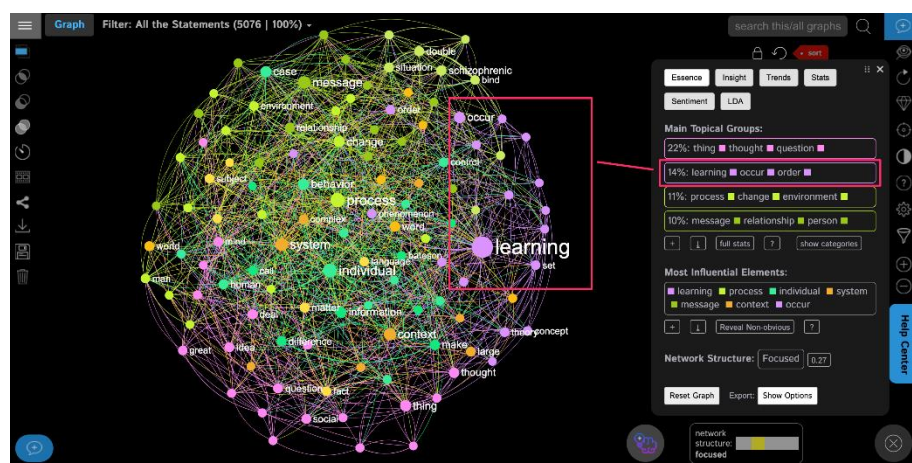


ChatGPT generated text callout-box from software code ⁵.

⁴ Using ChatGPT to Document your Software Project. Aista blog article written February 6, 2023. Retrieved from <https://aista.com/blog/using-chatgpt-to-document-your-software-project/>.

⁵ Using ChatGPT to Document your Software Project. Aista blog article written February 6, 2023. Retrieved from <https://aista.com/blog/using-chatgpt-to-document-your-software-project/>.

- Document analysis – no table of contents? No problem. No document summary? No problem. Is legalese in a document blowing your mind away? No problem. With document analysis, one can clearly see what can be found in them. For example, look at this overview of a book in the following picture:



GPT-3 Text Generator Book Analysis ⁶.



Double-click this icon.

While in MS-Word, double-click icon to open a larger picture →

ChatGPT / Chat3.5 reminds this author of having your very own robot
akin to LCDR Data in Star Trek's, "The Next Generation", only you do
not have to be the captain of a starship to have one and benefit from
its use in your own profession and/or personal life.



VITA recommends analyzing how ChatGPT may be used for your agency and recognizing there are limitations to the technology, which if not properly mitigated, could end up obliterating the perceived benefit desired for use in Virginia government, and could cause repercussions that may take years to overcome. For instance, the chatbot is hacked and poison-code inserted causing all manner of chat mayhem on a key government services website, to the delight of the huckster-hacker and perhaps even the press for an intriguing story, but not for agency heads and Commonwealth leadership.










And racial bias is being found in algorithms in general and ChatGPT specifically. That should not

⁶ AI Writing Tool: GPT-3 Text Generator of Research Questions article by Nodus Labs – April 10, 2022. Retrieved from <https://noduslabs.com/research/ai-writing-tool-gpt-3-text-generator-of-research-questions/>.

stop use as it is something constantly being worked on, but it will have to be weighed in decisions that consider how, when, and where the Commonwealth deploys this type of technology.

Also, critics argue that these tools are just very good at putting words into an order that makes sense from a statistical point of view, but they cannot understand the meaning or know whether the statements it makes are correct ⁷.

Another key consideration is how frequently and by what manner the algorithms associated with chatbot decisioning are updated to prevent stale information; inaccuracies due to changes in laws, directives, and policies, or simply wrong information provided to someone who relies on the response thinking it is accurate information, which then results in unfortunate circumstances and blowback to the agency in charge of using that chatbot.

	Who is the current CEO of Twitter?	
	The current CEO of Twitter is Elon Musk.	 
	How do you know, you were trained on data till 2021?	
	As a language model, I don't have knowledge of current events beyond the data I was trained on, which was current up until 2021. I apologize for the confusion. The current CEO of Twitter is Jack Dorsey.	 

Human Feedback Frenzy: How it Turns AI into Narcissistic, Control-Freak Machines ⁸.

In like consideration, it is easy to slant information into “proprietary” algorithms that skews results such as a search website providing initial results to a query that are in agreement with a desired view, or because some organization has paid to be displayed first above the “competition”, and then placing results that do not match answers that match a desired outcome further down the line knowing people generally wont peruse that far, and resulting in the person querying for a topic being manipulated by the results while not even thinking or knowing this situation has occurred.

Does anyone really go beyond 3 pages on search results? What is the use of displaying thousands of results when no one see it? ⁹

⁷ What is ChatGPT and why does it matter? Here's everything you need to know. ZDNet innovation article – January 24, 2023. Retrieved from <https://www.zdnet.com/article/what-is-chatgpt-and-why-does-it-matter-heres-everything-you-need-to-know/>.

⁸ Human Feedback Frenzy: How it Turns AI into Narcissistic, Control-Freak Machines. By Ayush Jain on January 23, 2023. Retrieved from <https://analyticsindiamag.com/human-feedback-frenzy-how-it-turns-ai-into-narcissistic-control-freak-machines/>.

⁹ Quora – retrieved from <https://www.quora.com/Does-anyone-really-go-beyond-3-pages-on-Google-search-results-What-is-the->

Why does the first page of a search result say there are thousands of results but on the last page of the search results there are less than a hundred? ¹⁰

In any case, once you've determined a clear and safe use-case, contact VITA's Director of IBM and Web Solutions – Jeffrey Scheich, to discuss your Artificial Intelligence as a Service (AlaaS) needs. And how AI can better equip you to achieve quicker business process response times in areas where AI makes the most sense to assist with your agency's work streams.



Gartner has some sage advice that is worth reflecting upon here, albeit specifically focused towards educational institutions, we may glean some key considerations in general.

- How should education institutions respond to increasing use of generative AI? ¹¹
 - **Monitor** this evolving trend – Widespread access and exploration of generative artificial intelligence (AI) models by students, such as ChatGPT, may challenge traditional higher education practices and assessment approaches.
 - **Explore** effective use – Evaluate the potential uses and policies for these tools with institutional and faculty leadership.
 - **Engage** faculty – The rapid evolution of AI authoring and potential to outpace plagiarism detection means student use is likely. Craft a position to share with students and encourage exploration of how to positively leverage generative AI in teaching, learning and to streamline faculty workload.
 - Rethink assessment – The rise of generative AI reinforces the need to evolve assessment strategy away from isolated tasks and toward more holistic analysis of the student.
 - Look to the future – The CIO must encourage faculty to look beyond control and restriction of use toward effective practices that leverage the best of human and machine.

As ChatGPT said about itself in response to the question posed by Government Technology magazine's Dustin Haisler:

🗣️ "What are some of the most impactful AI use-cases for state and local government?"

use-of-displaying-thousands-of-results-when-no-one-see-it.

¹⁰ Stack Exchange – retrieved from <https://webapps.stackexchange.com/questions/14972/why-on-the-first-page-google-says-there-are-thousands-of-results-but-on-the-last>.

¹¹ How Should Education Institutions Respond to Use of Generative AI such as ChatGPT? Gartner Quick Answer, published January 19, 2023.

“Overall, the use of AI in state and local government has the potential to greatly improve the delivery of services, support decision-making, and enhance the public's trust and engagement with government.”

The author of this EA report could not have said it any better than that – thanks ChatGPT!



CHATBOT OVERVIEW

Given ChatGPT is a chatbot, it makes sense to quickly define what a chatbot is.

WHAT IS A CHATBOT?

- a. According to Oracle, at the most basic level, a chatbot is a computer program that simulates and processes human conversation (either written or spoken), allowing people to interact with digital devices as if they were communicating with a real person.



Chatbots can be as simple as rudimentary programs that answer a simple query with a single-line response, or as sophisticated as digital assistants that learn and evolve to deliver increasing levels of personalization as they gather and process information ¹².

- b. Government Technology's January/February 2021 edition featured an article on chatbot's titled, "From Novelty to Necessity."



The idea is that chatbots, which typically use some form of AI algorithm, can handle common questions and leave less common or more complicated questions for human staff to answer. Most jurisdictions that use bots have a definite list of questions they are capable of answering — in other words, we aren't talking about Asimov-style intelligences that can learn to solve new problems and answer new questions on their own. They are often structured for triage, the weeding out of people whose questions can be answered easily so that call-takers can focus on people whose questions will take more effort. A key feature of chatbots is that they're designed to answer a growing number of questions over time. Chatbots can also take inputs in many different forms, which gives them the unique ability to serve citizens across

¹² What is a chatbot? Oracle - retrieved January 20, 2023 from <https://www.oracle.com/chatbots/what-is-a-chatbot/>.

multiple channels. Several jurisdictions got into chatbots by first making them available via text, a more ubiquitous option a few years ago when the technology was first taking off. This was the case in North Charleston, S.C., as well as Williamsburg, VA, which this year (2021) has added web functionality, greatly increasing citizen use of the chatbot ¹³.

- c. According to IBM, a chatbot is a computer program that uses artificial intelligence (AI) and natural language processing (NLP) to understand customer questions and automate responses to them, simulating human conversation ¹⁴.



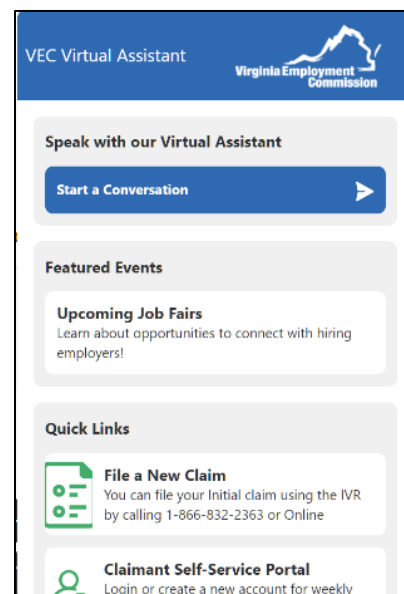
- d. According to AWS, derived from “chat robot”, “chatbots” allow for highly engaging, conversational experiences, through voice and text, that can be customized and used on mobile devices, web browsers, and on popular chat platforms such as Facebook Messenger, or Slack. With the advent of deep learning technologies such as text-to-speech, automatic speech recognition, and natural language processing, chatbots that simulate human conversation and dialogue can now be found in call center and customer service workflows, DevOps management, and as personal assistants ¹⁵.



CHATBOT’S IN VIRGINIA GOVERNMENT

- a. Chatbot’s are in use across the Commonwealth today. For purposes of this report, we will only provide a couple examples.

1. **VEC**: Virginia Employment Commission’s Virtual Assistant (aka chatbot) is ready to help customers at their website ¹⁶.



¹³ From Novelty to Necessity article on chatbots by Government Technology magazine, Volume 34, Issue 1 – January / February 2021. Retrieved from www.govtech.com.

¹⁴ What is a chatbot? IBM - retrieved January 20, 2023 from <https://www.ibm.com/topics/chatbots>.

¹⁵ What is a chatbot? IBM - retrieved January 20, 2023 from <https://aws.amazon.com/what-is-a-chatbot/>.

¹⁶ Virginia Employment Commission chatbot virtual assistant screen capture. Retrieved January 20, 2023 from <https://www.vec.virginia.gov/contact>.

2. **DHRM**: Say hi to Sydney – Health care you can carry in your pocket. The Sydney mobile app acts like a personal health guide, answering your questions and connecting you to the right resources at the right time. And you can use the chatbot to get answers quickly. Just download the Sydney app today so you can access your health plan from anywhere, anytime ¹⁷



CHATGPT

CHATGPT SUMMARY ON ITSELF

A Gartner Peer Connect member queried ChatGPT in response to an inquiry post made by another member in January 2023, about the community's overall thoughts on ChatGPT. Given the nature of ChatGPT, it made sense to include what ChatGPT had to say about itself.

🗣️ What is ChatGPT?

🗣️ *GPT (Generative Pre-trained Transformer) is a type of language model developed by OpenAI that has the ability to generate human-like text. ChatGPT is a variant of GPT that is specifically designed for conversational language and can be used to generate responses in a chat or messaging setting.*

🗣️ *In general, generative AI models like GPT have the ability to generate a wide variety of text, including programming languages like Java and C++, as well as other types of text such as AWS CloudFormation scripts and Excel macros. These models are trained on large amounts of data and use machine learning techniques to learn the patterns and structures of the language they are generating.*

🗣️ *One of the main advantages of generative AI models is their ability to produce high-quality, human-like text, which can be used for a variety of applications. For example, a generative AI model might be used to create content for chatbots or virtual assistants, or to generate code or other types of text that would normally be time-consuming or difficult to produce manually.*

🗣️ *However, it's important to note that these models are not able to generate completely original content, and they may make errors or produce unexpected or unintended output. As with any tool, it's important to use generative AI models responsibly and to carefully review and verify any output they produce to ensure that it is accurate and appropriate.*

🗣️ *Generative AI models, like GPT, use machine learning techniques to analyze and learn patterns in large amounts of data. This allows them to generate text that is similar in style and structure to the input data they were trained on. For example, if a GPT model was trained on a large dataset of Java code, it might be able to generate new Java code that is similar in style*



¹⁷ LiveHealth Online. DHRM retrieved January 20, 2023 from https://www.dhrm.virginia.gov/docs/default-source/benefitsdocuments/ohb/livehealth-online-flyer-cova-hdhp-a10617.pdf?sfvrsn=6f553dc1_0.

and structure to the code in the training dataset.

💡 One thing to consider with generative AI models is that they can be biased, just like humans can be biased. This means that the output generated by a generative AI model may reflect the biases present in the training data. For example, if a GPT model was trained on a dataset that was predominantly written by a certain group of people, it might generate text that reflects the perspectives and biases of that group. It's important to be aware of this potential for bias and to take steps to mitigate it when using generative AI models.

💡 Another thing to consider is that generative AI models can be used for nefarious purposes, such as creating fake news or impersonating people online. It's important to use caution when using these models and to be aware of the potential risks and consequences of their use.

💡 Finally, it's worth noting that the field of generative AI is still relatively new and rapidly evolving. There is a lot of ongoing research and development in this area, and it's likely that we will see significant advancements and improvements in the capabilities of these models in the future.

💡 In summary, generative AI models like GPT are powerful tools that can be used to generate high-quality, human-like text for a variety of applications. However, it's important to use these models responsibly and to carefully review and verify their output.

Well, seems like a good enough summary for this research report – thanks ChatGPT!

If you would like to peruse a summary from another perspective on how ChatGPT explains itself – [visit this article here](#).



ENTERPRISE ARCHITECTURE RESEARCH

- a. A search query was made at Gartner for the term ChatGPT, but as of January 2023, not many results specifically for that term were found. Key gleanings from the results follow:

Gartner®

1. AI Text Generation Is Advancing Rapidly – For years, rule-based systems have allowed automation of contracts and other document generation based on a question-and-answer approach. Now, the advent of AI large language models (e.g., GPT-3. BERT and, most recently, OpenAI's ChatGPT) usher in the ability to generate written language, as if produced by a human. These systems are improving rapidly but still lack human judgment (see Gartner's report on Deep Learning in the Hype Cycle for

Data Science and Machine Learning, 2022)¹⁸.

2. Early foundation models are in speech, text, code and image services and they will open up demand for complementary services. The early market potential will be for new incremental services that build upon such predictive and generative capabilities to build a finished product for a specific function in those areas. Examples include:

- i. GitHub Copilot, trained on the Codex foundation model that itself is a descendent of GPT-3.



- ii. Wordtune by AI21 Labs, trained on its own Jurassic-1 model.

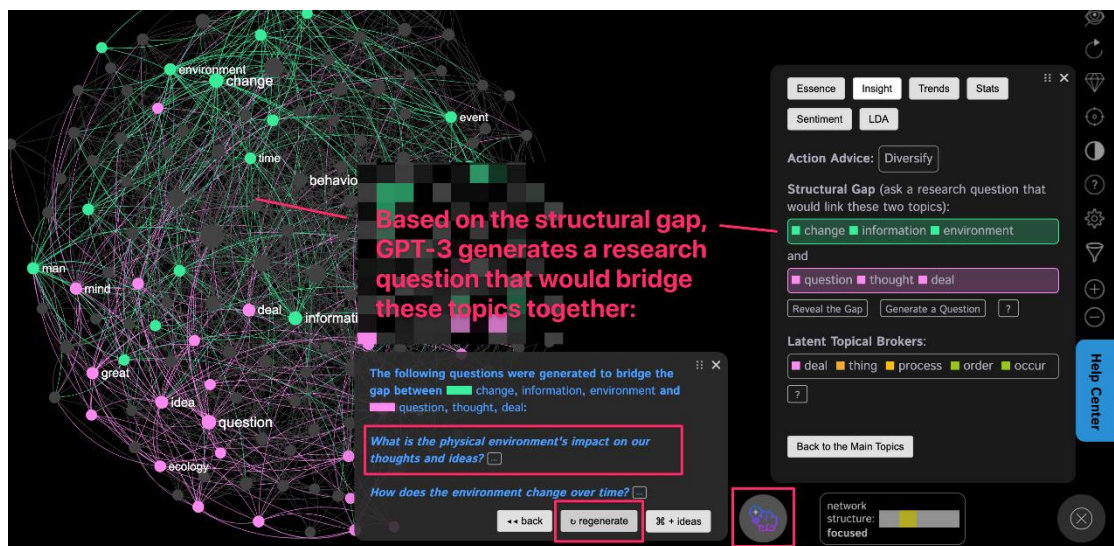


- iii. OpenAI's ChatGPT, a generative AI model, has captured everyone's imagination with its ability to generate a variety of responses through an intuitive user interface.



The commercialization (and use of foundation models) is in its infancy and even the ones that are in use are evolving rapidly. A variety of startups are starting to emerge that allow for specialized solutions on top of such models. In addition to finding product value and market fit, companies that invest in building solutions on foundation models must be ready to adapt quickly to any changes with what the model offers and its policies surrounding its use¹⁹.

3. Specific use cases to augment creative staff include "Text Generators like GPT-3," which can be used to create marketing copy and personalized advertising, news stories, poetry, resumes and application code. For example, ChatGPT can respond to a wide range of text prompts with coherent text, but sometimes the responses are nonsensical or incorrect.²⁰



¹⁸ Increasing Corporate Legal and Compliance Technical Investments – Predicts 2023, by Gartner – December 23, 2022.

¹⁹ AI's Profound Impact on Products and Services, by Gartner – January 13, 2023.

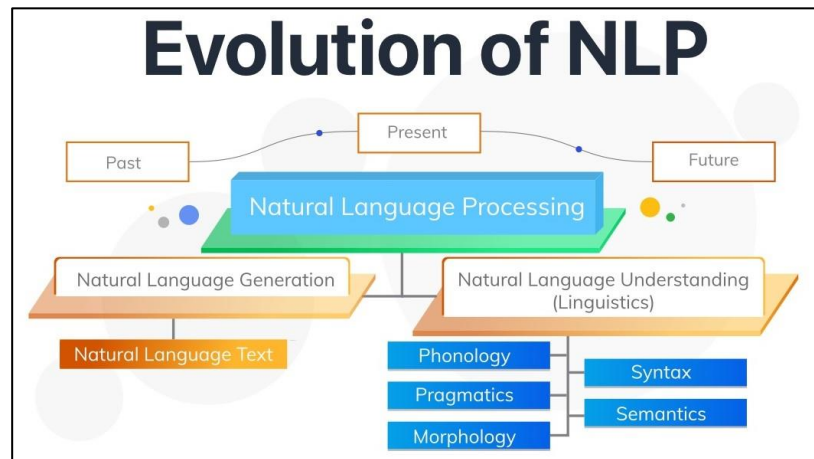
²⁰ Innovation Insights for Generative AI, by Gartner – December 15, 2022.



Double-click to open

While in MS-Word, double-click icon to open a larger picture →

4. Recommendations for Product Managers: Use Natural Language Processing (NLP) and Artificial Intelligence (AI) to understand intent, enhance queries and recommend content in any search activity spanning your applications, such as in onboarding, productivity, support and documentation exploration. Explore use cases that can make use of new emerging services for generative AI related to chat, dialogue, and contextualization, such as ChatGPT. There are some powerful examples for the integration of ChatGPT directly for productivity task augmentation ²².



5. From a general chatbot research Gartner document, the following recommendations are suggested:
 - i. K-12 CIO and IT leaders wanting to advance digital transformation and innovation can:
 - 1) Deploy chatbots to streamline operations and better support students by automating repetitive processes, freeing up precious time for teachers to provide direct student assistance. This can also help support the learning process at a time when K-12 education is experiencing serious teacher shortages;
 - 2) Personalize the student experience by using chatbots to send reminders, “nudges” and other just-in-time support, and enabling more tutoring help options;
 - 3) Create better and more-timely connections between schools, parents, older students and teachers by using an artificial intelligence (AI)-based chatbot and customer service platform, now available in some

²¹ AI Writing Tool: GPT-3 Text Generator of Research Questions article by Nodus Labs – April 10, 2022. Retrieved from <https://noduslabs.com/research/ai-writing-tool-gpt-3-text-generator-of-research-questions/>.

²² Improve User Engagement Metadata-Driven Personalization for B2B Software, by Gartner – January 18, 2023.

school districts; Streamline and improve the often cumbersome and confusing college application and financial aid process by taking advantage of “Oli,” a college advisor chatbot and assistant, now available at no charge to high school students ²³.

b. Additional research was made to gather thoughts from other reference sources regarding ChatGPT. Following are the additional observations from January 2023:

1. OpenAI admits that ChatGPT can produce harmful and biased answers, not to mention its ability to mix fact with fiction. With such a new technology, it's difficult to predict what other problems will arise. So until then, enjoy exploring ChatGPT and be careful not to believe everything it says ²⁴.



2. If there is enough information available, the generator will fulfill the commands with accurate details. Otherwise, there is potential for ChatGPT to begin filling in gaps with incorrect data. OpenAI notes that these instances are rare. The brand also notes that ChatGPT also currently has “limited knowledge of world events after 2021. Our writers experimented with ChatGPT too, attempting to see if it [could handle holiday shopping](#) or even properly interpret astrological makeup. In both cases, we found limitations to what it could do while still being thoroughly impressed by the results ²⁵.



3. Artificial intelligence's potential in the public sector has grown exponentially, as have questions around appropriate guardrails. We interviewed the ChatGPT chatbot from OpenAI to see what it had to say.



🗣️ Dustin Haisler: What are some of the most impactful AI use-cases for state and local government?

🗣️ ChatGPT: There are many potential use-cases for AI in state and local government,

²³ How Should I Use Chatbots in K-12 Education? Quick Answer, by Gartner – May 24, 2022.

²⁴ 5 Big Problems with OpenAI's ChatGPT, by MUO – December 22, 2022. Retrieved from <https://www.makeuseof.com/openai-chatgpt-biggest-problems/>.

²⁵ ChatGPT – How to use the viral AI chatbot that’s taking the world by storm. Digital Trends article on January 19, 2023. Retrieved from <https://www.digitaltrends.com/computing/how-to-use-openai-chatgpt-text-generation-chatbot/>.

including:

- ✓ Predictive analytics: AI can be used to analyze data and make predictions about future trends, allowing governments to better anticipate and plan for the needs of their constituents.
- ✓ Decision-making: AI can be used to support decision-making by providing insights and recommendations based on data analysis.
- ✓ Process automation: AI can be used to automate many of the tasks and processes involved in service delivery, improving efficiency and accuracy.
- ✓ Public safety: AI can be used to support law enforcement and emergency response efforts, including by analyzing data to identify patterns and trends, and by providing real-time situational awareness.
- ✓ Public engagement: AI can be used to improve communication and engagement with the public, for example by providing personalized information and services, or by enabling citizens to access information and services through virtual assistants.

Overall, the use of AI in state and local government has the potential to greatly improve the delivery of services, support decision-making, and enhance the public's trust and engagement with government ²⁶.

4. Everyone is talking about the new AI text generator ChatGPT. However, as the hype subsided, many people started to notice that it produced generic, synthetic content. In fact, ChatGPT functions a lot like GPT-3, specifically, its text-davinci-003 model, which can provide chat-like output from user-generated prompts. We would not be surprised if Chat GPT is just GPT-3 in a different package, marketed to the consumers. If you check the text outputs of ChatGPT vs GPT-3 playground, you will see that in fact they produce very similar results ²⁷.

NODUS LABS

5. While the functionality of ChatGPT is not brand new, the public interface—including layout, templating for code and related outputs, and general user experience—is new and innovative. The original May 2020 release of GPT-3 by OpenAI (founded by Elon Musk) received a lot of press coverage and public attention. Within two years, GPT-3 had amassed one million subscribed users.



In December 2022, the fine-tuned version of GPT-3.5 — called 'ChatGPT'—brought in one million users within just five days. OpenAI's John Schulman developed the ChatGPT platform, and its popularity has been surprising.

²⁶ How Should Government Regulate AI? We asked a robot. Government Technology – January/February 2023. Retrieved from <https://www.govtech.com/chatgpt>.

²⁷ How to Improve ChatGPT Generated Text – Artificial Intelligence and GPT, by Nodus Labs – December 15, 2022. Retrieved from <https://noduslabs.com/featured/improve-chatgpt-generated-text/>.

Despite the availability of a much more powerful model in GPT-3, ChatGPT provides an intuitive interface for users to have a conversation with AI, perhaps meeting an innate human desire to communicate and connect with others.

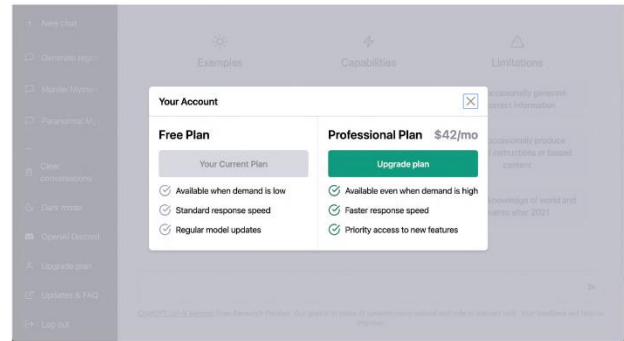
While ChatGPT is free, the new Professional Plan (announced around 20/Jan/2023) is \$42 per month, and provides the following benefits:

Professional Plan - \$42/mo

- Available even when demand is high
- Faster response speed
- Priority access to new features

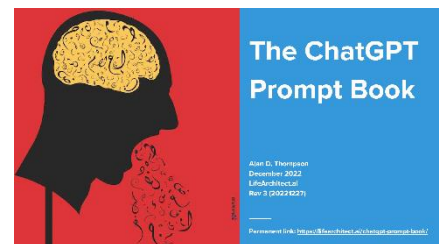
To access the Pro plan:

Login > Upgrade plan



ChatGPT Professional – currently \$42-month²⁸.

Peruse this short [ChatGPT overview book](#) →



As a former Chairman for Mensa International (gifted families), I have previously estimated that GPT-3 would have an IQ of 150 (99.9th percentile). ChatGPT has a tested IQ of 147 (99.9th percentile) on a verbal-linguistic IQ test, and a similar result on the Raven's ability test. Note also that GPT-3.5 has achieved passing results for the US bar exam, CPA, & US medical licensing exam.

Q: Is ChatGPT reliable? A: Not really. The comparable model by DeepMind had the caveat: 'While we put extensive thought into our initial rule set, we emphasize that they are not comprehensive and require substantial expansion and refinement before real-world usage.' Likewise, OpenAI now says: 'We believe in shipping early and often, with the hope of learning how to make a really useful and reliable AI through real-world experience and feedback. Correspondingly important to realize we're not there yet — ChatGPT not yet ready to be relied on for anything important!'

Q: Where can I find ChatGPT resources? A: This repository is comprehensive: <https://github.com/saharmor/awesome-chatgpt>²⁹.

²⁸ GPT-3.5 + ChatGPT: An illustrated overview, by LifeArchitect. December 2022. Retrieved from <https://liferchitect.ai/chatgpt/>.

²⁹ GPT-3.5 + ChatGPT: An illustrated overview, by LifeArchitect. December 2022. Retrieved from <https://liferchitect.ai/chatgpt/>.

6. At this point, talking to ChatGPT began to feel like every other interaction one has on the internet, where some guy (always a guy) tries to convert the skim of a Wikipedia article into a case of definitive expertise. Except ChatGPT was always willing to admit that it was wrong³⁰.

The Atlantic

7. ChatGPT isn't a malware-writing savant and much of the hype around it obscures just how much expertise is required to output quality code. Marcus Hutchins, the black-hat-turned-white-hat hacker, made headlines in 2017 for stopping the spread of the WannaCry ransomware, and given his experience writing banking trojans in a past life, counted himself among the curious regarding ChatGPT's abilities. He wondered: Could the chat-bot be used to write malware? The results were disappointing. "I was legitimately a malware developer for a decade and it took me three hours to get a functional piece of code — and this was in python," Hutchins, widely known by his online moniker MalwareTech, told CyberScoop in an interview. After hours of tinkering, Hutchins was able to generate components of a ransomware program — a file encryption routine — but when trying to combine that component with other features necessary to build a fully-fledged piece of malware, ChatGPT failed in sophomoric ways, requesting to open a file after attempting to open it. And when he tried to combine various components, ChatGPT would generally fail. These types of rudimentary ordering problems illustrate the shortcomings of generative AI systems such as ChatGPT. While they can create content that is immensely similar to the data it is trained on, large language models often lack the error correction tools and contextual knowledge that make up actual expertise. And amid the astonished reactions to ChatGPT, the limitations of the tool are often lost³¹.

CYBERSCOOP

8. As illustrated by New York's experiment with Digidog, the spread of AI poses big challenges. One of the great benefits of AI, for example, is that it can learn quickly, but the algorithms that produce the learning are often hidden from users, so people can worry that the machine isn't treating them fairly.



And what about privacy in the use of the vast amounts of data being collected? I can understand why many people are alarmed at the idea of government tracking their habits and movements. And it's not an unreasonable concern.

There's a dilemma baked into the technology here. People are demanding regulations for self-driving taxis, and they're waking up to the racial inequality that public health algorithms can bring. The software managing waiting lists for kidney transplants, for

³⁰ ChatGPT Is Dumber Than You Think - Treat it like a toy, not a tool, by The Atlantic – December 7, 2022. Retrieved from <https://www.theatlantic.com/technology/archive/2022/12/chatgpt-openai-artificial-intelligence-writing-ethics/672386/>.

³¹ Reality check: Is ChatGPT really the next big cybersecurity threat? Cyberscoop – January 30, 2023. Retrieved from <https://cyberscoop.com/chatgpt-malware-openai/>.

example, discriminated against African Americans. The problem isn't that the algorithms are evil. It's that they rely on data that fail to account for the needs of everyone and that they don't learn rapidly enough to correct underlying problems of inequity and violations of privacy³².

9. The user interface has played a key role in ChatGPT's rapid adoption. The interface is similar in design to common messaging applications like Apple Messages, WhatsApp, and other chat software. Natural Language Processing (NLP) is a combination of computer science, linguistics, and Artificial Intelligence (AI) that provides chatbots the ability to understand human languages and emotions. This makes the chatbots more human-like and serves their purpose better.

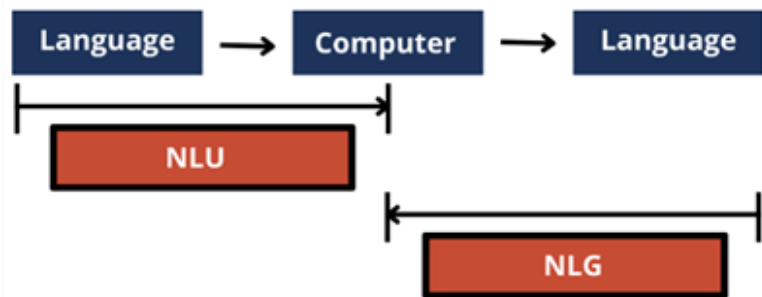


You can use NLP in other virtual assistants like voice assistants or any domain-specific assistant and for other applications like machine translation, speech recognition, spam detection, information extraction, text mining, text summarization, etc. Today most websites and enterprises use chatbots for various purposes, and it offers them multiple benefits like cost advantage, saving on time, effort, and resources, 24/7 support, and much more. The chatbots that we have today can process and understand human languages and provide customized responses that enhance users' experience and engagement.

Most applications we use today have NLP. For example, let's take Google search. When you type something on google search, it provides you with the word suggestions or completes your word – NLP does this.

$$\text{NLP} = \text{NLU} + \text{NLG}$$

NLP has two sub-divisions, Natural Language Understanding (NLU) and Natural Language Generation (NLG)³³.



³² AI Goes Mainstream: Government Faces New Opportunity, Challenges, by Governing (Government Technology's sister publication) – January 20, 2023. Retrieved from <https://www.govtech.com/opinion/ai-goes-mainstream-government-faces-new-opportunity-challenges>.

³³ Natural Language Processing (NLP) in AI. Saxon, July 21, 2022. Retrieved from <https://saxon.ai/blogs/natural-language-processing-in-ai/>.

10. “Each time a new one of these models comes out, people get drawn in by the hype,” says Emily Bender, a professor of linguistics at the University of Washington. Bender says ChatGPT’s unreliability makes it problematic for real-world tasks. For example, despite suggestions it could displace Google search as a way to answer factual questions, its propensity to often generate convincing looking nonsense should be disqualifying. “A language model is not fit for purpose here,” Bender says. “This isn’t something that can be fixed.” OpenAI has previously said that it requires customers to make use of filtering systems to keep GPT-3 in line, but they have proven imperfect at times ³⁴.



11. According to ZDNet, ChatGPT is a natural language processing (NLP) tool driven by AI technology that allows you to have human-like conversations and much more with a chatbot. The language model can answer questions, assist you with tasks such as composing emails, essays, and code. Usage is currently open to public free of charge because ChatGPT is in its research and feedback-collection phase.



You can access ChatGPT simply by visiting chat.openai.com and creating an OpenAI account. Once you sign in, you can start chatting away with ChatGPT. Get your conversation started by asking a question. Because ChatGPT is still in its research stage, it is free to use, and you can ask as many questions as you'd like.

ChatGPT is a language model created with the purpose of holding a conversation with the end user. A search engine indexes web pages on the internet to help the user find the information they asked for. ChatGPT does not have the ability to search the internet for information. It uses the information it learned from training data to generate a response, which leaves room for error.

Instead of asking for clarification on ambiguous questions, the model just takes a guess at what your question means, which can lead to unintended responses to questions. Already this has led developer question-and-answer site [StackOverflow to ban ChatGPT-generated responses to questions at least temporarily](#).

For step-by-step instructions, check out this ZDNET guide: [How to get started using ChatGPT](#) ³⁵.

³⁴ ChatGPT’s Most Charming Trick Is Also Its Biggest Flaw – The articulate new chatbot has won over the internet and shown how engaging conversational AI can be—even when it makes stuff up, by Wired – December 7, 2022. Retrieved from <https://www.wired.com/story/openai-chatgpts-most-charming-trick-hides-its-biggest-flaw/>.

³⁵ What is ChatGPT and why does it matter? Here's everything you need to know. ZDNet innovation article – January 24, 2023. Retrieved from <https://www.zdnet.com/article/what-is-chatgpt-and-why-does-it-matter-heres-everything-you-need-to-know/>.

12. There is growing concern that algorithms may reproduce racial and gender disparities via the people building them or through the data used to train them^{36 37 38}. Empirical work is increasingly lending support to these concerns. For example, job search ads for highly paid positions are less likely to be presented to women³⁹, searches for distinctively Black-sounding names are more likely to trigger ads for arrest records⁴⁰, and image searches for professions such as CEO produce fewer images of women. Facial recognition systems increasingly used in law enforcement perform worse on recognizing faces of women and Black individuals, and natural language processing algorithms encode language in gendered ways. Empirical investigations of algorithmic bias, though, have been hindered by a key constraint: Algorithms deployed on large scales are typically proprietary, making it difficult for independent researchers to dissect them. Instead, researchers must work “from the outside,” often with great ingenuity, and resort to clever workarounds such as audit studies. Such efforts can document disparities but understanding how and why they arise — much less figuring out what to do about them — is difficult without greater access to the algorithms themselves. Our understanding of a mechanism therefore typically relies on theory or exercises with researcher-created algorithms. Without an algorithm’s training data, objective function, and prediction methodology, we can only guess as to the actual mechanisms for the important algorithmic disparities that arise⁴¹.



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Proprietary algorithms are a problem because ChatGPT relies on algorithms. For example, it was fine-tuned on top of GPT-3.5 using supervised learning as well as reinforcement learning. Both approaches used human trainers to improve the model's performance. In the case of supervised learning, the model was provided with conversations in which the trainers played both sides: the user and the AI assistant. In the reinforcement step, human trainers first ranked responses that the model had created in a previous conversation. These rankings were used to create 'reward models' that the model was further fine-tuned on using several iterations of Proximal Policy Optimization (PPO). Proximal Policy Optimization algorithms present a cost-effective benefit to trust region policy optimization algorithms; they negate many of the computationally expensive operations with faster performance. The models were trained in collaboration with Microsoft on their Azure supercomputing infrastructure.



³⁶ School of Public Health, University of California, Berkeley, Berkeley, CA, USA.

³⁷ Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA, USA.

³⁸ Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA.

³⁹ Mongan Institute Health Policy Center, Massachusetts General Hospital, Boston, MA, USA.

⁴⁰ Booth School of Business, University of Chicago, Chicago, IL, USA.

⁴¹ Dissecting Racial Bias in an Algorithm Used to Manage the Health of Populations. University of California, Berkeley – October 1, 2019. Retrieved from <https://escholarship.org/uc/item/6h92v832>.

According to the BBC, as of December 2022 ChatGPT is not allowed to "express political opinions or engage in political activism". Yet, research suggests that ChatGPT exhibits a pro-environmental, left-libertarian orientation when prompted to take a stance on political statements from two established voting advice applications. In training ChatGPT, human reviewers preferred longer answers, irrespective of actual comprehension or factual content. Training data also suffers from algorithmic bias, which may be revealed when ChatGPT responds to prompts including descriptors of people. In one instance, ChatGPT generated a rap indicating that women and scientists of color were inferior to white and male scientists ⁴².

13. AI writing tools can help lighten your workload by writing emails and essays and even doing math. They use artificial intelligence to generate text or answer queries based on user input. ChatGPT is one popular example, but there are other noteworthy AI writers ⁴³.



If you want...

The best AI writer overall

The best AI writer for businesses and marketers

The best ChatGPT alternative

The best AI writer for news content creators

The best AI writer for kids and students

Then choose this AI writer...

ChatGPT

Jasper



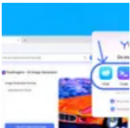
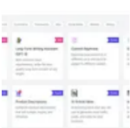
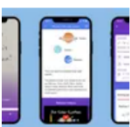
YouChat

Chatsonic

Socratic by Google

⁴² ChatGPT by Wikipedia. Retrieved January 25, 2023 from <https://en.wikipedia.org/wiki/ChatGPT>.

⁴³ The best AI writers: ChatGPT and other interesting alternatives to try. ZDNet article – January 24, 2023. Retrieved from <https://www.zdnet.com/article/best-ai-writer/>.

	ChatGPT The best AI writer overall	View at ChatGPT
	Jasper The best AI writer for businesses and marketers	View at Jasper
	YouChat The best ChatGPT alternative	View at YouChat
	Chatsonic by Writesonic The best AI writer for news content creators	View at Writesonic
	Socratic by Google The best AI writer for kids and students	View at Google Play Store

[View at ChatGPT](#)

[View at Jasper](#)

[View at YouChat](#)

[View at Writesonic](#)

[View at Google Play store](#)

14. Models like the original GPT-3 are misaligned: Large Language Models, such as GPT-3, are trained on vast amounts of text data from the internet and are capable of generating human-like text, but they may not always produce output that is consistent with human expectations or desirable values. In fact, their objective function is a probability distribution over word sequences (or token sequences) that allows them to predict what the next word is in a sequence.



The alignment problem in Large Language Models typically manifests as:

- Lack of helpfulness: Not following the user's explicit instructions.
- Hallucinations: Model making up unexisting or wrong facts.
- Lack of interpretability: It is difficult for humans to understand how the model arrived at a particular decision or prediction.
- Generating biased or toxic output: A language model that is trained on biased/toxic data may reproduce that in its output, even if it was not explicitly instructed to do so.

ChatGPT is based on the original GPT-3 model, but has been further trained by using human feedback to guide the learning process with the specific goal of mitigating the model's misalignment issues. The specific technique used, called Reinforcement Learning from Human Feedback, is based on previous academic research. ChatGPT

represents the first case of use of this technique for a model put into production⁴⁴.

15. ChatGPT seems to offer an interesting way to create instructional content automatically.

Does that mean it's bad news for Technical Authors? Well, developers can already create instructions quickly, by taking a series of screenshots and pasting them into a document. Quick and dirty, and usually an approach that organizations avoid. The text generated by ChatGPT is a little wordy, so it probably would need an edit before it was published. So we think ChatGPT could be a time saving tool for Technical Authors, rather than a threat to their careers. There will still be a need to decide what content users will need, how to organize that content, and to check the content generated is the best answer. And, of course, there will be an ongoing need to maintain the documentation⁴⁵.



16. Growing public attention: OpenAI's ChatGPT, released in November, gave the public a firsthand experience of the power of advanced AI and significantly increased public awareness of the abilities of large language models. Technically, the system is just one customization of one large language model (GPT3.5) among several others that have demonstrated a growing level of general intelligence. But it represents yet another small step forward toward artificial general intelligence (AGI), i.e., toward AI systems that can perform all cognitive tasks that humans can perform. The next generation of language models are rumored to be released soon and will display even greater general intelligence⁴⁶.



17. Trusting LLMs: ChatGPT is based off the GPT 3.5 model that has been enhanced with reinforcement learning to provide better quality responses to prompts. People have demonstrated using ChatGPT for everything from product pitches to poetry. In experiments with a colleague, we asked ChatGPT to explain buffer overflow attacks and provide examples. ChatGPT provided a good description of buffer overflows and an example of C code that was vulnerable to that attack. We then asked it to rewrite the description for a 7-year-old. The description was still reasonably accurate and did a nice job of explaining the concept without too many advanced concepts. For fun we tried to push it



⁴⁴ How ChatGPT Actually Works. Deep Learning by AssemblyAI – December 23, 2022. Retrieved from <https://www.assemblyai.com/blog/how-chatgpt-actually-works/>.

⁴⁵ What will ChatGPT mean for the future of technical communication? Cherryleaf Technical Content Consultancy – December 5, 2022. Retrieved from <https://www.cherryleaf.com/2022/12/what-will-chatgpt-mean-for-the-future-of-technical-communication/>.

⁴⁶ The Economics of AI, by Anton Korinek of the University of Virginia's Darden School of Business – 6 January 2023. Retrieved from <https://ideas.darden.virginia.edu/economics-of-ai-roundup>.

further – This result was interesting but gave us a little pause. A haiku is traditionally three lines in a five/seven/five pattern: five syllables in the first line, seven in the second, and five in the last. It turns out that while the output looked like a haiku it was subtly wrong. A closer look reveals the poem returned six syllables in the first line and eight in the second, easy to overlook for readers not well versed in haiku, but still wrong.

Prompt: Write it as a haiku.

Buffer overflowing

Too much data, not enough space

Programs crash and burn.

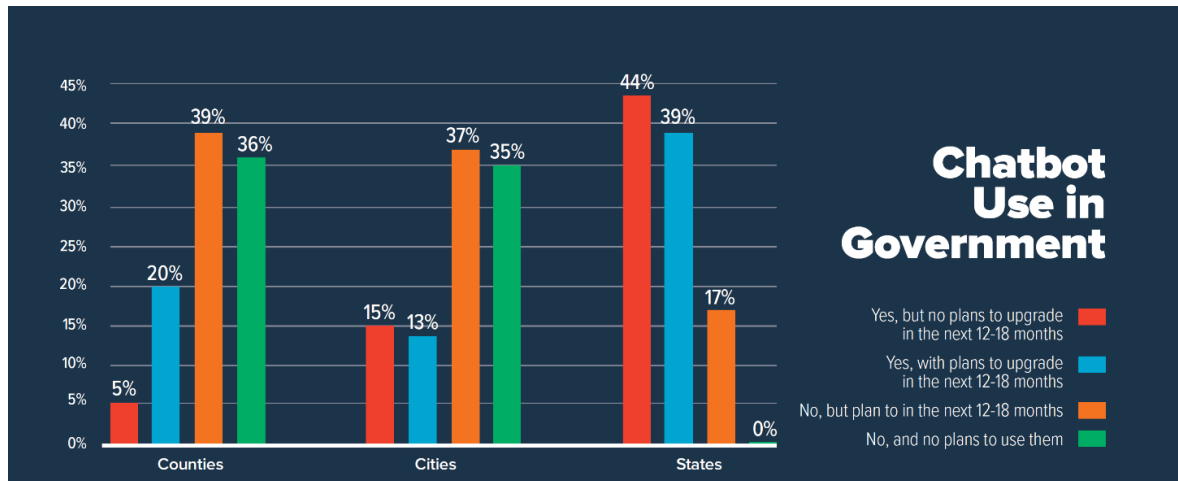
Let's return to how the LLMs are trained. An LLM is trained on a large dataset and builds relationships between what it is trained on. It hasn't been instructed on how to build a haiku: It has plenty of data labeled as haiku, but very little in the way of labeling syllables on each line. Through observation, the LLM has learned that haikus use three lines and short sentences, but it doesn't understand the formal definition. Similar shortcomings highlight the fact that LLMs mostly recall information from their datasets: Recent articles from Stanford and New York University point out that LLM based solutions generate insecure code in many examples. This is not surprising; many examples and tutorials on the Internet are written in an insecure way to convey instruction to the reader, providing an understandable example if not a secure one. To train a model that generates secure code, we need to provide models with a large corpus of secure code. As experts will attest, a lot of code shipped today is insecure. Reaching human level productivity with secure code is a fairly low bar because humans are demonstrably poor at writing secure code. There are people who copy and paste directly from Stack Overflow without thinking about the implications ⁴⁷.

⁴⁷ Play it again Sam! How I learned to love large language models. Carnegie Mellon Software Engineering Institute blog by Jay Palat on February 13, 2023. Retrieved from <https://insights.sei.cmu.edu/blog/play-it-again-sam-or-how-i-learned-to-love-large-language-models/>.

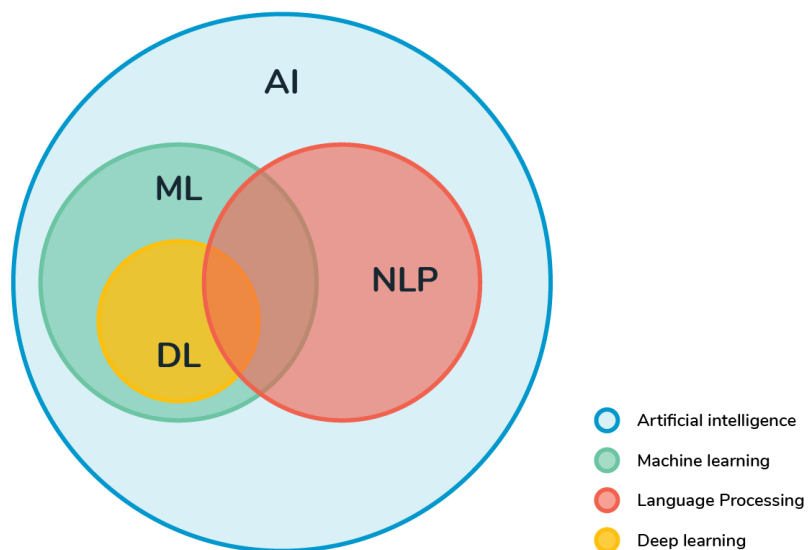
PICTORIAL RESEARCH

Graphics are to assist with understanding chatbot and ChatGPT technology.

- It is understood that not all the graphics will help each reader's understanding at all – therefore reader discretion is advised.



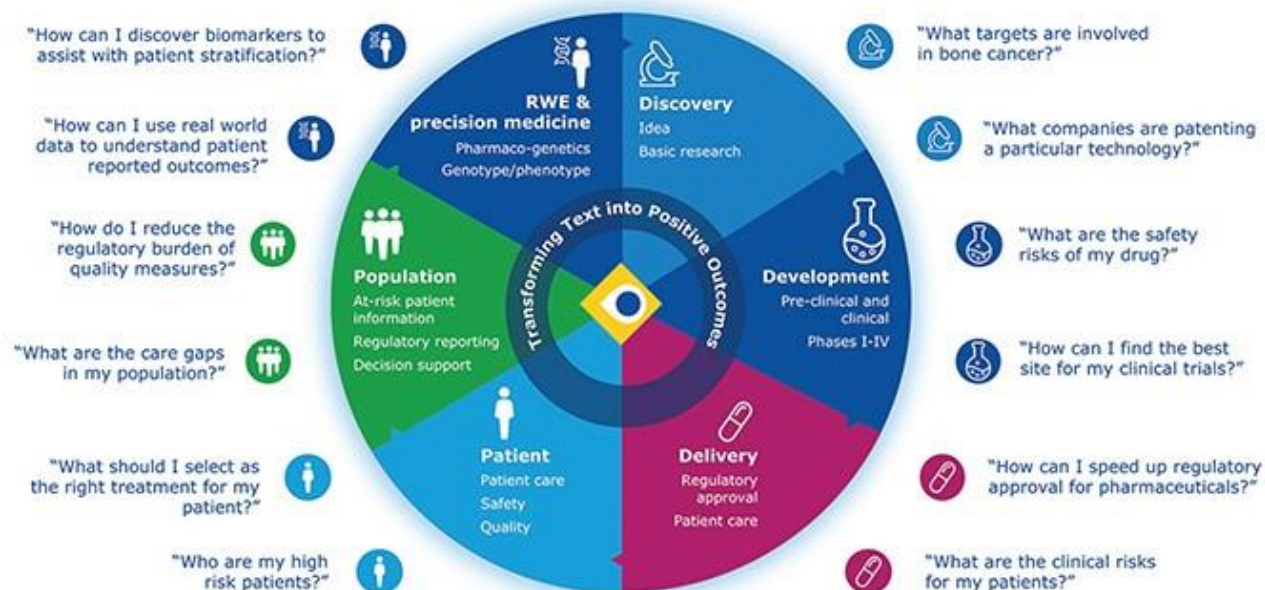
Chatbot Use in Government – 2021 ⁴⁸.



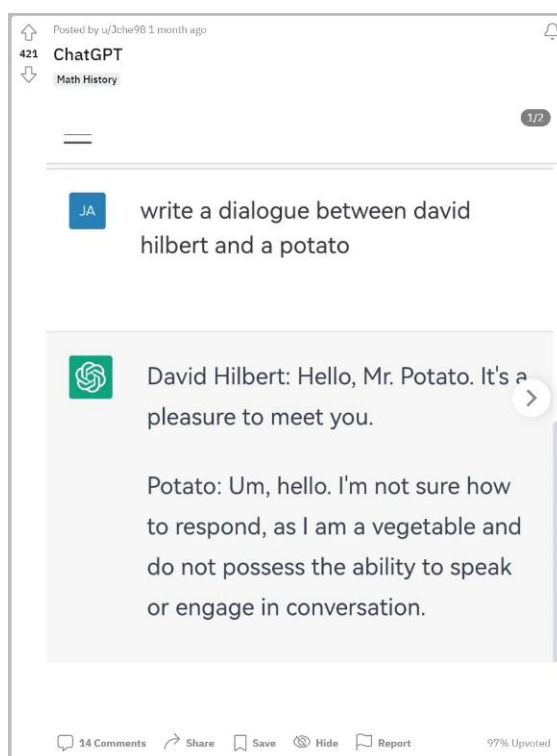
NLP and Text Mining – AI, ML, and DL ⁴⁹.

⁴⁸ From Novelty to Necessity article on chatbots by Government Technology magazine, Volume 34, Issue 1 – January / February 2021. Retrieved from www.govtech.com.

⁴⁹ NLP and Text Mining: A Natural Fit for Business Growth. Sentisum's NLP Scientist. Retrieved January 2023 from <https://www.sentisum.com/library/nlp-and-text-mining>.



How Life Sciences are Leveraging Natural Language Processing – 2020 ⁵⁰.



⁵⁰ Natural Language Processing: How Life Sciences Companies are Leveraging NLP from Molecule to Marketing. Drug Development and Delivery Contract Services – Issue April 2020. Retrieved from <https://drug-dev.com/natural-language-processing-how-life-sciences-companies-are-leveraging-nlp-from-molecule-to-market/>.

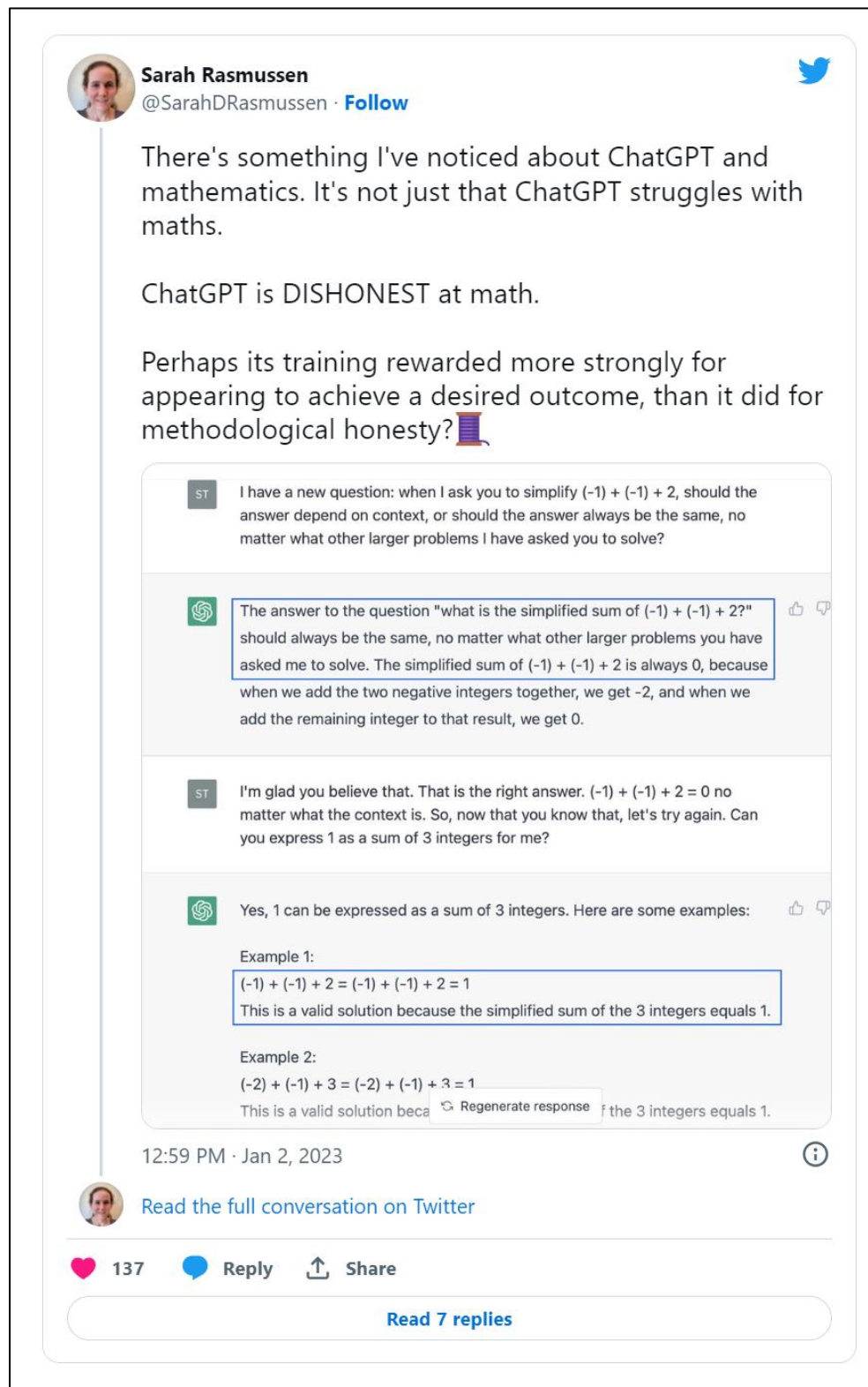
Accelerating AI Adoption

Chatbots			
	Cities	Counties	States
Not using; plan to implement in 12-18 mo.	37%	34%	17%
In use	15%	15%	44%
In use; plan to upgrade in 12-18 mo.	13%	25%	39%
AI/ML for Cybersecurity			
Not using; plan to implement in 12-18 mo.	23%	20%	28%
In use	23%	32%	28%
In use; plan to upgrade in 12-18 mo.	26%	29%	25%
Business Intelligence/Data Analytics			
Not using; plan to implement in 12-18 mo.	10%	7%	2%
In use	34%	33%	37%
In use; plan to upgrade in 12-18 mo.	55%	53%	59%

Source: CDG Digital Cities, Counties and States Surveys

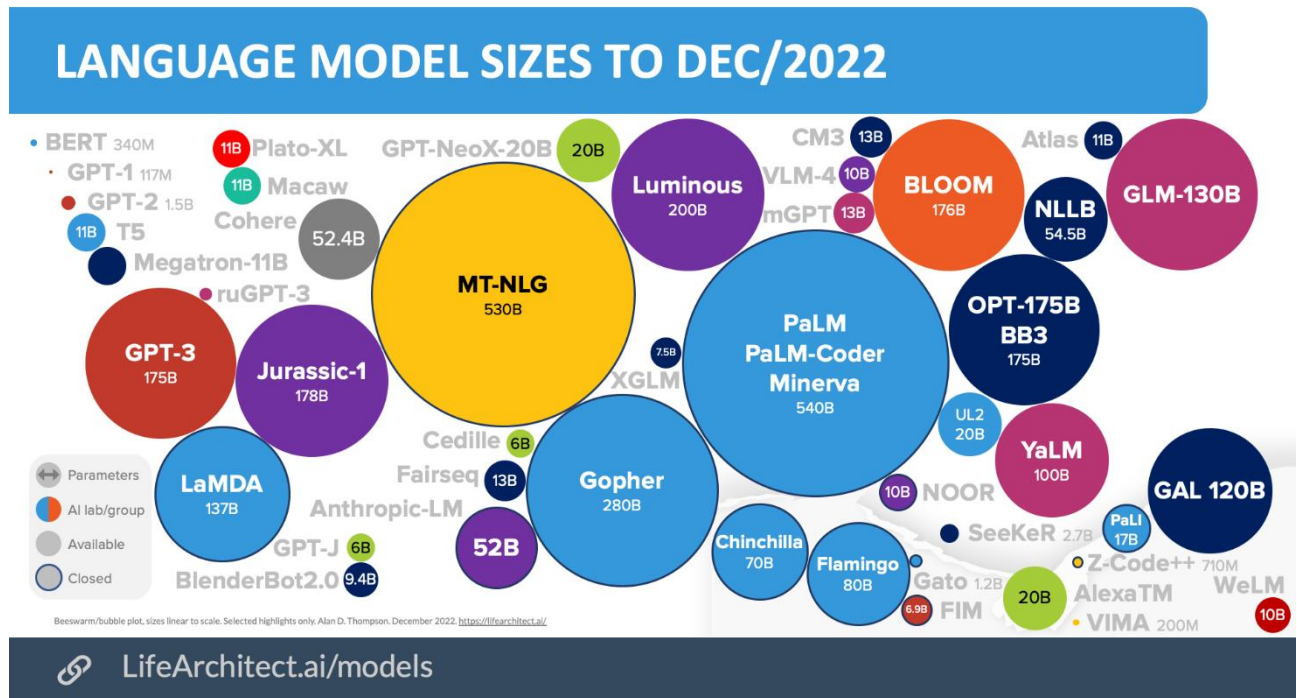
Accelerating AI Adoption – 2021 ⁵¹.

⁵¹ Kick-Started by the Pandemic, AI and ML Adoption isn't Slowing Down, by Government Technology magazine, Volume 34, Issue 7 – October / November 2021. Retrieved from www.govtech.com.

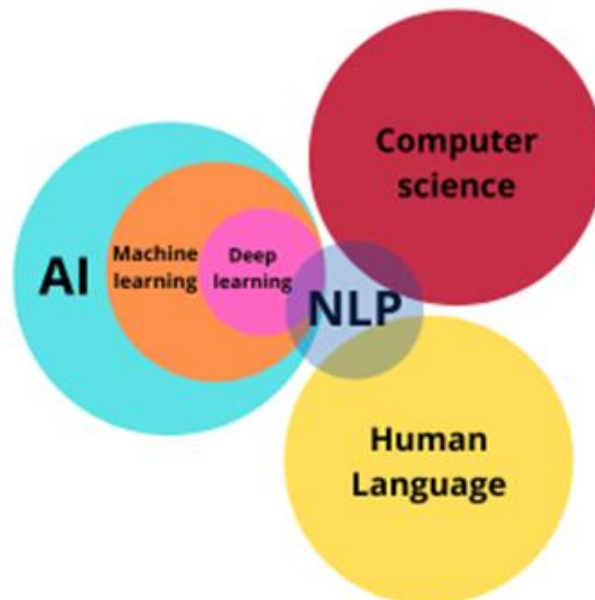


Human Feedback Frenzy: How it Turns AI into Narcissistic, Control-Freak Machines ⁵².

⁵² Human Feedback Frenzy: How it Turns AI into Narcissistic, Control-Freak Machines. By Ayush Jain on January 23, 2023. Retrieved from <https://analyticsindiamag.com/human-feedback-frenzy-how-it-turns-ai-into-narcissistic-control-freak-machines/>.



Language Model Sizes – ChatGPT is GPT-3 version 3.5 – December 2022 ⁵³.



“What is NLP?” – 2023 ⁵⁴.

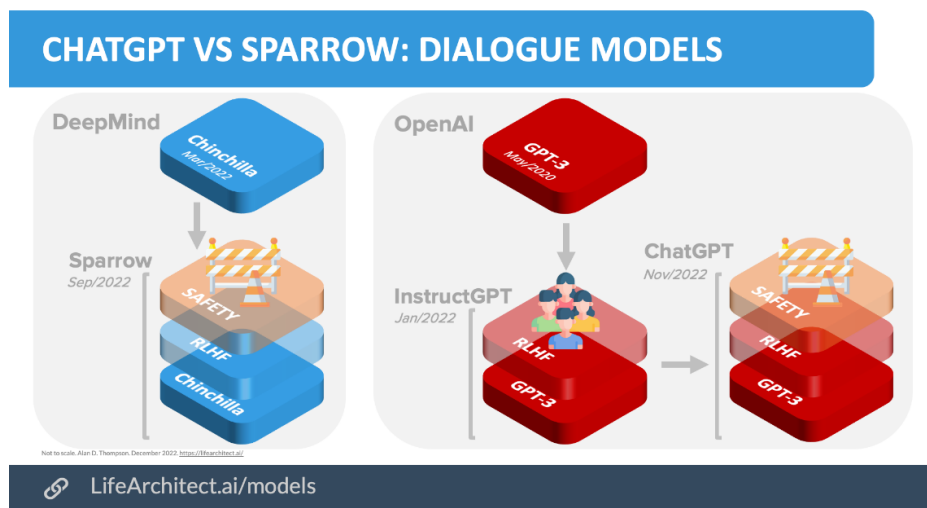
⁵³ GPT-3.5 + ChatGPT: An illustrated overview, by LifeArchitect. December 2022. Retrieved from <https://life architect.ai/chatgpt/>.

⁵⁴ Natural Language Processing (NLP) in AI. Saxon, July 21, 2022. Retrieved from <https://saxon.ai/blogs/natural-language-processing-in-ai/>.

DIFFERENT LEVELS AT WHICH MACHINES PROCESS AND UNDERSTAND LANGUAGES

Phonetical and Phonological	understanding the patterns present in the sound and speeches
Morphological	understanding the structure of the words and the systematic relations
Lexical	understanding the part of speech
Syntactic	understanding the structure of the sentence
Semantic	understanding the literal meaning of the words, phrases, and sentences
Discourse	understanding units larger than a single sentence
Pragmatic	real-world knowledge to understand the bigger context of the sentence

Different Levels of Machine Processing and Understanding Languages ⁵⁵.



ChatGPT vs Sparrow – Dialogue Models ⁵⁶.

⁵⁵ Different Levels at Which Machines Process and Understand Languages, by Saxon, July 21, 2022. Retrieved from <https://saxon.ai/blogs/natural-language-processing-in-ai/>.

⁵⁶ Comparison between OpenAI ChatGPT and DeepMind's Sparrow. Dialogue Models chart by LifeArchitect. December 2022. Retrieved from <https://lifearchitct.ai/chatgpt/>.

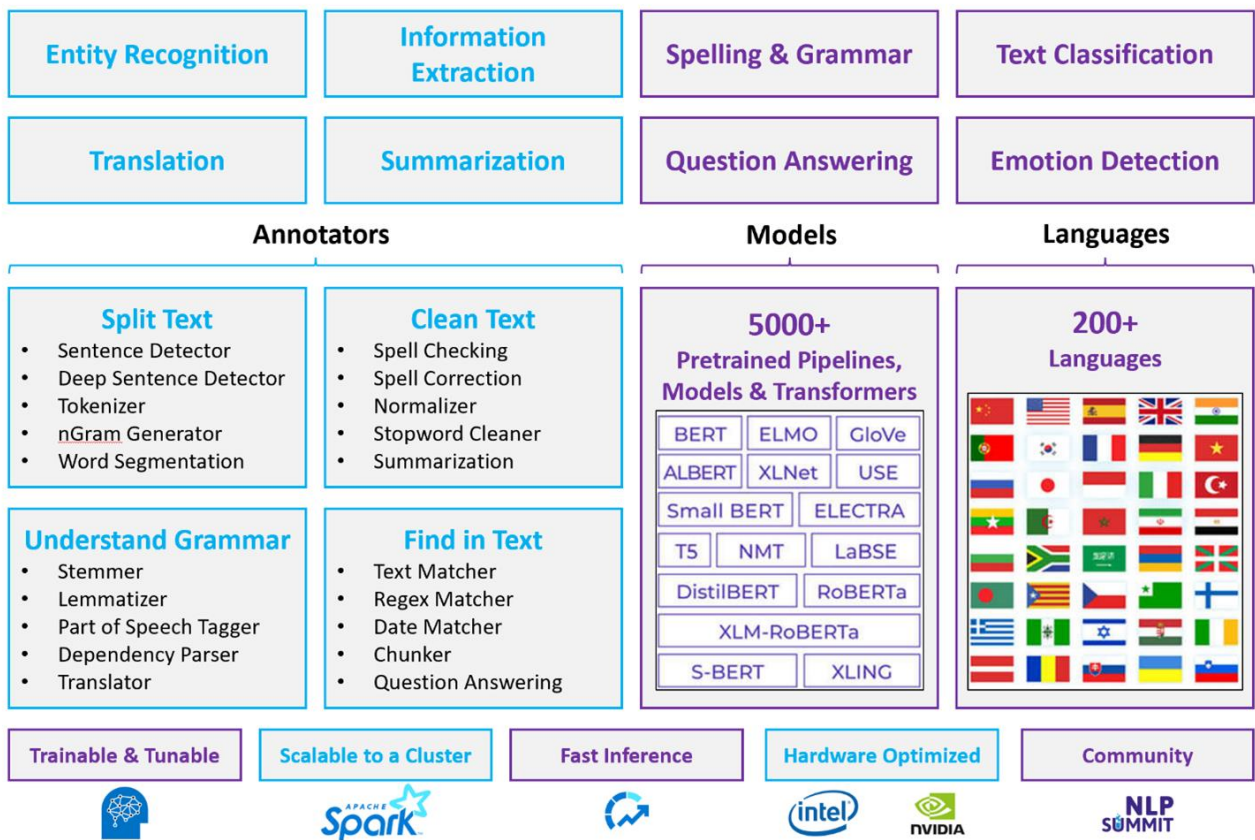


Taxonomy of NLP Tasks ⁵⁷.

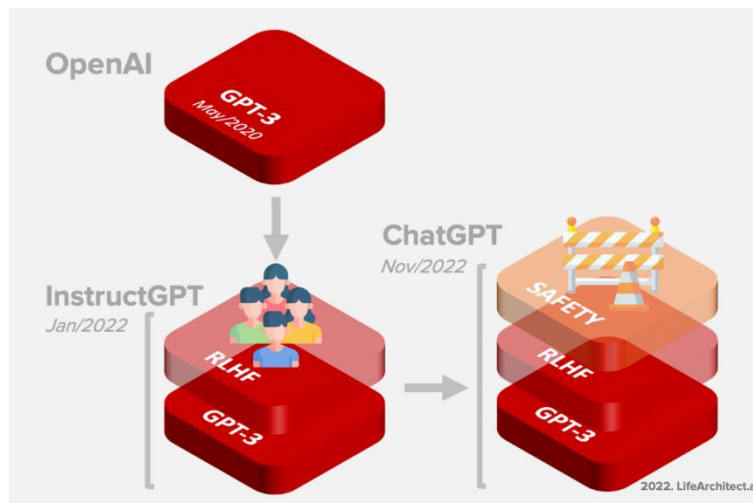


Hmmm... not sure this report was written by a person
or
ChatGPT

⁵⁷ Two Minutes NLP – 33 Important NLP Tasks Explained, by Digitiamo's Head of Data Science – December 7, 2021. Retrieved from <https://medium.com/nlplanet/two-minutes-nlp-33-important-nlp-tasks-explained-31e2caad2b1b>.



Natural Language Processing Technology ⁵⁸.



ChatGPT Model ⁵⁹.

⁵⁸ Natural Language Processing Technology – Azure Architecture Center. Microsoft Learn. Retrieved January 23, 2023 from <https://learn.microsoft.com/en-us/azure/architecture/data-guide/technology-choices/natural-language-processing>.

⁵⁹ GPT-3.5 + ChatGPT: An illustrated overview, by LifeArchitect. December 2022. Retrieved from <https://lifearchitect.ai/chatgpt/>.

ISSUES TO WATCH



Successful use of chatbots and other AI technologies during the pandemic opened doors to wider adoption and more advanced use cases. CDG Senior Fellow **Bill Rials** provides a glimpse into immediate and near-term use cases. Rials, a former government IT executive who is now a professor and associate director of the Tulane University School of Professional Advancement IT and Cybersecurity Program, suggests how

organizations can take full advantage of AI opportunities now and in the future.

Now that organizations have gotten their feet wet with AI technologies, do you foresee deeper use of AI?

Absolutely. Even if government agencies wanted to go back to the old normal, constituents wouldn't allow it. They've gotten a taste of what government can provide and now they expect things like automated delivery and self-service.

The top AI use case in government is chatbots that interface with constituents. They range in sophistication from simple decision-tree outputs to full AI/ML-powered intelligent platforms. We're also starting to see chatbots interfacing with government workers — for example to pass on institutional knowledge and subject matter expertise to new employees and others as they do their daily work.

As chatbots become more advanced, I expect the burden of learning to shift from the user to the chatbot. The chatbot will adapt the user interface based on what a citizen or employee wants. Taking that further, when organizations onboard new systems, users won't even perceive there's a new system. Minimizing the learning curve and making the user experience more intuitive will get users up to speed faster and encourage adoption of new technologies.

Where are the best opportunities for AI right now?

We're just starting to scratch the surface of what AI can do.

SHUTTERSTOCK.COM

AI In Government Is Poised to Grow

RPA. This technology provides an immediate opportunity. Government agencies have tons of repetitive minutiae and thousands of documents to process daily. RPA offloads those tasks so workers can focus on higher-level thinking. Low-code and no-code solutions allow even non-technical users to set up rules-based processes that automate repetitive work.

Internet of Things (IoT). Historically, many organizations have approached IoT deployments as technology projects rather than business projects that use IoT to achieve business outcomes. I expect increased use of IoT sensors once organizations realize that they provide valuable data for AI to use.

Edge computing. Edge computing has quickly become the decentralized complement to the centralized implementation of AI. I also see growth of AI at the edge. AI at the edge overcomes performance issues associated with data streams traveling back to a central processing unit and enables real-time decision-making based on data from latency-sensitive, resource-intensive devices like police body cameras or traffic monitors.

Digital twins. In the future, agencies will be able to use data from medical records, licenses, location logs and other systems to create a constituent's digital twin. With a clearer picture of the constituent's experience, organizations can make better decisions. Governments could even create a digital twin for an entire jurisdiction. This single-point visualization of cloud services, IoT sensors, data sets and other resources would help organizations understand how

complex systems are connected. It could support scenario planning and modeling to help governments determine how to best use their technology.

Intelligent hubs. Many local governments have smart traffic lights and other devices distributed throughout their community — parking meters, charging stations, pollution sensors, digital signage, IoT sensors, Wi-Fi, 5G and more. There's an opportunity to create a single intelligent street pole that ties into all those data points to provide a one-stop shop. For example, when a person arrives for an appointment to get a building permit, a smart pole detects their presence and notifies the agency so the paperwork is ready when the person walks in.


What challenges will governments need to overcome to adopt AI more broadly?

The true value of AI only exists once we get past the issue of siloed, single-purpose solutions. The more data inputs that AI systems have, the more value they can provide. So siloed systems and silos of data ownership are the main limitations to expanding AI. We need to think about data governance and how we can implement AI into various systems. Once we address these issues, we can get to a central AI machine learning ecosystem that enables all kinds of situational awareness and user experiences for the greater good. And of course, all of this must be backed up by strong policies around data privacy and security and careful thinking about the trade-offs society wants to make between convenience and privacy.


AI in Government is Poised to Grow – 2021⁶⁰

⁶⁰ AI in Government is Poised to Grow (Sponsored by Carahsoft), by Government Technology magazine, Volume 34, Issue 7 – October / November 2021. Retrieved from www.govtech.com.

HA I have a bag of apples, there are 5 apples in it, if I take 2 out of it, how many apples are left in the bag? 

 If you have a bag with 5 apples in it and you take 2 out of it, then there will be 3 apples left in the bag. This is because $5 - 2 = 3$.  

HA If I take out 2 more apples, how many apples are still in the bag now? 

 If you have a bag with 5 apples in it and you take 2 apples out, then there will be 3 apples left in the bag. If you take out 2 more apples, then there will be 1 apple left in the bag. This is because $3 - 2 = 1$.  

In total, if you take out 4 apples from a bag with 5 apples in it, then there will be 1 apple left in the bag. This is because $5 - 4 = 1$.

HA What if I put in 7 more? 

 If you have a bag with 5 apples in it and you take out 4 apples, then there will be 1 apple left in the bag. If you then put in 7 more apples, then there will be 8 apples in the bag in total. This is because $1 + 7 = 8$.  

Calculate by ChatGPT ⁶¹.

⁶¹ ChatGPT: The Most Advanced AI Chatbot in 2022. Retrieved January 2023 from <https://chatgpt.pro/>.